

## **CLAIMS**

It is claimed:

1. A method of testing real-world performance of a system under test coupled to a communications network, the method comprising
  - providing the system under test
  - providing a device comprising a chassis and one or more adapter cards disposed in the chassis, the adapter cards comprising hardware and software
  - coupling the device to the communications network
  - the device setting up for simulation of a realistic mix of network traffic on the communications network
  - the device simulating the realistic mix of network traffic on the communications network
  - the device setting up for engaging in transactions with the system under test
  - the device engaging in transactions with the system under test concurrently with the step of simulating the realistic mix of network traffic on the communications network, wherein the transactions result in additional network traffic on the communications network
  - the device measuring performance of the system under test under load of the transactions, wherein the performance of the system under test depends on the transactions and the network traffic on the communications network including the simulated network traffic from the device.

2. The method of testing real-world performance of an system under test of claim 1, wherein

the system under test comprises an application, the application operative on a server, the application for providing user-level interaction with plural client computers on the communications network

the providing step comprises providing the server and the application operative thereon.

3. The method of testing real-world performance of an system under test of claim 1, wherein the system under test comprises a server load balancer.

4. The method of testing real-world performance of an system under test of claim 1, wherein the system under test comprises a stateful network communications device.

5. The method of testing real-world performance of a system under test of claim 1, wherein the performance of the system under test is characterized by how the server supports the simulated network traffic.

6. The method of testing real-world performance of a system under test of claim 1, wherein the simulated network traffic is generated by a stateless packet processor.

7. The method of testing real-world performance of a system under test of claim 1, wherein the system under test comprises a stateful application which uses underlying services of TCP.

8. The method of testing real-world performance of a system under test of claim 7, wherein the system under test comprises an HTTP server.
9. The method of testing real-world performance of a system under test of claim 7, wherein the system under test comprises an FTP server.
10. The method of testing real-world performance of a system under test of claim 1 further comprising
  - modifying a behavior of the network traffic simulated by the device
  - continuing to engage in transactions with the system under test
  - continuing to measure performance of the system under test.
11. The method of testing real-world performance of a system under test of claim 10, the modifying step comprising using performance metrics to modify the behavior of the simulated network traffic to more closely simulate a realistic mix of network traffic.
12. The method of testing real-world performance of a system under test of claim 11 wherein the performance metrics are selected from the group consisting of retransmission rate, fragmentation, packet sizes, and drop/reset rates.
13. The method of testing real-world performance of a system under test of claim 10, the modifying step comprising a user using a control program to change the behavior of the simulated network traffic via a system interface.

14. The method of testing real-world performance of a system under test of claim 10, the modifying step comprising the user managing multiple ports in a coordinated fashion.

15. An apparatus for testing real-world performance of a system under test coupled to a communications network, the apparatus comprising

a chassis

one or more adapter cards disposed in the chassis, the adapter cards comprising hardware and software, the hardware and software for

setting up for simulation of a realistic mix of network traffic on the communications network

simulating the realistic mix of network traffic on the communications network

setting up for engaging in transactions with the system under test

engaging in transactions with the system under test concurrently with

simulating the realistic mix of network traffic on the communications network, wherein the transactions result in additional network traffic on the communications network

measuring performance of the system under test under load of the transactions in the conditions of the network traffic.

16. The apparatus for testing real-world performance of a system under test of claim 15 wherein the adapter cards include a stateless packet processor for simulating the realistic mix of network traffic on the communications network.

17. The apparatus for testing real-world performance of a system under test of claim 15 further comprising hardware and software for modifying a behavior of the simulated network traffic.
18. The apparatus for testing real-world performance of a system under test of claim 17, further comprising hardware and software for using performance metrics to modify the behavior of the simulated network traffic to more closely simulate a realistic mix of network traffic.
19. The apparatus for testing real-world performance of a system under test of claim 18 wherein the performance metrics are selected from the group consisting of retransmission rate, fragmentation, packet sizes, and drop/reset rates.
20. The apparatus for testing real-world performance of a system under test of claim 15 further comprising hardware and software for changing a behavior of the simulated network traffic in response to user instructions.
21. An apparatus for testing real-world performance of a system under test coupled to a communications network, the apparatus comprising
  - a chassis
  - one or more cards disposed in the chassis, the adapter cards comprising
    - first means for setting up for simulation of a realistic mix of network traffic on the communications network

second means for simulating the realistic mix of network traffic on the communications network

third means for setting up for engaging in transactions with the system under test

fourth means for engaging in transactions with the system under test concurrently with simulating the realistic mix of network traffic on the communications network, wherein the transactions result in additional network traffic on the communications network

fifth means for measuring performance of the system under test under load of the transactions in the conditions of the network traffic.

**22.** The apparatus for testing real-world performance of a system under test of claim 21 wherein the second means comprises a stateless packet processor for simulating the realistic mix of network traffic on the communications network.

**23.** The apparatus for testing real-world performance of a system under test of claim 21, further comprising sixth means for modifying a behavior of the simulated network traffic.

**24.** The apparatus for testing real-world performance of a system under test of claim 23, the sixth means for using performance metrics to modify the behavior of the simulated network traffic to more closely simulate a realistic mix of network traffic.

**25.** The apparatus for testing real-world performance of a system under test of claim 24 wherein the performance metrics are selected from the group consisting of retransmission rate, fragmentation, packet sizes, and drop/reset rates.

**26.** The apparatus for testing real-world performance of a system under test of claim 21 further comprising sixth means for changing a behavior of the simulated network traffic in response to user instructions.

**27.** An enterprise load system for testing a system under test available on a communications network, the enterprise load system comprising:

first means for simulating real-world network traffic on the communications network

second means for generating interactive transactions across the communications network with the system under test

third means for measuring performance of the system under test in supporting the interactive transactions from the second means despite the simulated traffic on the communication network from the first means

a controller coupled to the first means, the controller for changing quantity and quality of the network traffic simulated by the first means

wherein the first means, the second means and the third means operate concurrently.

**28.** The enterprise load system for testing a system under test available on a communications network of claim 27, wherein the first means is a stateless packet processor.

**29.** The enterprise load system for testing a system under test available on a communications network of claim 27, wherein the system under test software system comprises a stateful system under test which uses underlying services of TCP.

**30.** The enterprise load system for testing a system under test available on a communications network of claim 29, wherein the system under test comprises an HTTP server.

**31.** The enterprise load system for testing a system under test available on a communications network of claim 29, wherein the system under test software system comprises an FTP server.

**32.** The enterprise load system for testing a system under test available on a communications network of claim 27, the controller further for using performance metrics to cause the first means to more closely simulate a realistic mix of network traffic.

**33.** The enterprise load system for testing a system under test available on a communications network of claim 32 wherein the performance metrics are selected from the group consisting of retransmission rate, fragmentation, packet sizes, and drop/reset rates.

**34.** The enterprise load system for testing a system under test available on a communications network of claim 27 wherein the controller is responsive to instructions directed to the enterprise load system for changing a behavior of the simulated network traffic.



**35.** A method of testing a system under test available on a communications network, the method comprising:

simulating real-world network traffic on the communications network

generating interactive transactions across the communications network with the system under test

measuring performance of the system under test in supporting the interactive transactions from the second means despite the simulated traffic on the communication network from the first means

changing quantity and quality of the network traffic simulated by the first means

wherein the steps of simulating, generating and measuring are performed concurrently.

**36.** The method of testing a system under test available on a communications network of claim 35, wherein the performance of the system under test is characterized by how the simulated network traffic is supported.

**37.** The method of testing a system under test available on a communications network of claim 35, wherein the simulated network traffic is generated by a stateless packet processor.

**38.** The method of testing a system under test available on a communications network of claim 35, wherein the system under test comprises a stateful application which uses underlying services of TCP.

**39.** The method of testing a system under test software system available on a communications network of claim 38, wherein the system under test comprises an HTTP server.

**40.** The method of testing a system under test available on a communications network of claim 38, wherein the system under test comprises an FTP server.

**41.** The method of testing a system under test available on a communications network of claim 35 further comprising

modifying a behavior of the simulated network traffic

continuing to generate interactive transactions with the system under test software

system

continuing to measure performance of the system under test software system.

**42.** The method of testing a system under test available on a communications network of claim 41, the modifying step comprising using performance metrics to modify the behavior of the simulated network traffic to more closely simulate a realistic mix of network traffic.

**43.** The method of testing a system under test of claim 42 wherein the performance metrics are selected from the group consisting of retransmission rate, fragmentation, packet sizes, and drop/reset rates.

**44.** The method of testing a system under test available on a communications network of claim 41, the modifying step comprising a user using a control program to change the behavior of the simulated network traffic via a system interface.

**45.** The method of testing a system under test available on a communications network of claim 41, the modifying step comprising the user managing multiple ports in a coordinated fashion.